Requested Patent: GB621576A

Title: IMPROVEMENTS IN AND RELATING TO ARTIFICIAL LIMBS ;

Abstracted Patent: GB621576 ;

Publication Date: 1949-04-12 ;

Inventor(s): ;

Applicant(s): ANDRE MARCELL DESOUTTER ;

Application Number: GB19460020603 19460710 ;

Priority Number(s): GB19460020603 19460710 ;

IPC Classification: ;

Equivalents: ;

ABSTRACT:

PATENT SPECIFICATION

621,576

Application Date : July 10, 1946. No. 20603/46.

Complete Specification Left : June 26, 1947.

Complete Specification Accepted : April 12, 1949.

Index at acceptance:—Class 81(ii), B4b (2: 4).

PROVISIONAL SPECIFICATION.

Improvements in and relating to Artificial Limbs.

I, ANDRE MARCELL DESOUTTER a British subject, of Whitehatch, Oldfield Road, Horley, Surrey, do hereby declare the nature of this invention to be as follows:—

This invention relates to improvements in and relating to artificial limbs and more particularly to joints for artificial limbs.

The object of the present invention is to provide artificial limb joints of simple construction which will be comfortable to the wearer ensuring easy use and will require a minimum of maintenance.

According to this invention the two members of artificial limb joints are connected together solely by a block, pad or the like of rubber or similar material which is bonded or caused to adhere to both members thereby forming a resilient joint.

The two parts are preferably shaped with opposing faces formed to converge about the pivot point of the joint and the rubber block, pad or the like is shaped to conform to these faces, so that when bonded thereto the rubber is constrained to occupy central positions from which one part may move about the other in any direction to flex the joint. The forces thus set up within the rubber tend to urge it into its normal position, whereby on release the joint returns to the central position.

The opposing faces of the limb parts may be in the form of obtuse angled male and female members in which the angle of the male member is greater than in the female member.

Alternatively the two parts may be in the form of male and female members adapted to fit one inside the other, the male member being smaller than the female member to leave a space between the two members in which the rubber or like is interposed and bonded to the opposing faces of the two members. In such constructions the opposing faces may be of a convex outer or female face and a concave inner or male face, the two faces being closest at approximately their central portions and diverging outwards whereby the joint can be pivoted about its central portion. Alternatively the female member may be concave and the male member convex.

The male and female members may be formed with flat faces converging to opposing apices substantially at the centre of their length or they may be arcuate or spherical.

For certain types of joints the pivot point may be at or substantially at one end of the faces whereby the joint flexes wholly or substantially wholly in one direction.

The rubber or like material may be in one piece or may consist of layers bonded or vulcanized together.

The limb parts may be of metal, wood, plastic or other suitable substance to which rubber or similar material may be bonded or caused to adhere.

Rubber, artificial rubber or other suitable resilient substance may be used. The rubber or other suitable material may be bonded, vulcanized or otherwise caused to adhere to the opposing limb faces in any known manner. Where necessary, the opposing faces of the limb parts may be pre-treated before bonding the rubber thereto, in any known manner.

The joints according to the invention may be employed in any artificial limb joints, as for example, ankles, toes, knees, elbows or wrists.

Dated this 10th day of July, 1946.
ABEL & IMRAY,
Agents for the Applicant,
Quality House, Quality Court, Chancery Lane, W.C.2.

COMPLETE SPECIFICATION.

Improvements in and relating to Artificial Limbs.

I, ANDRE MARCELL DESOUTTER a British subject, of Whitehatch, Oldfield Road, Horley, Surrey, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to improvements in and relating to artificial limbs and more particularly to joints for artificial limbs.

Heretofore artificial limbs have been provided

with mechanical joints made of metal or like co-acting parts. In such joints resilient pads or springs may be provided to restrict movement about the joint in various directions. Such joints being of solid material are uncomfortable to wear since all shocks on the extremity of the artificial limb are transmitted directly to the wearer's stump.

In a jointed artificial limb according to the invention the opposing pads of the two relatively movable limb members are connected together solely by a block, pad or the like of rubber or similar suitable material which is bonded or caused to adhere to the opposing faces of the two limb members thereby forming a resilient joint. Where the artificial limbs are provided with two or more joints, such as the knee and ankle in a leg for example, one or more of the joints may be so formed.

The two parts are preferably shaped with opposing faces formed to converge about substantially the central point of the joint and the rubber block, pad or the like is shaped to conform to these faces, so that when bonded thereto the rubber is normally constrained to occupy a central position but may flex in any direction whereby one part may move about the other in any direction. The forces thus set up within the rubber tend to urge it into its normal or central position, whereby when the parts are free the rubber returns to such position.

The opposing faces of the limb parts may be in the form of obtuse angled members in which the angle of one is either equal to or greater or less than that of the other member. The joint thus formed may be resilient in all directions.

To enable the invention to be more fully understood it will now be described with reference to the accompanying drawings in which: —

Fig. 1 is a cross-section through the ankle joint of an artificial leg and foot constructed according to the invention,

Fig. 2 is a partial view similar to Fig. 1, but exploded to show the formation of the joint members;

Figs. 3-4 are sections similar to Fig. 1 showing other forms of ankle joints according to the invention,

Figs. 5 and 7 are views similar to Fig. 1 but at right angles thereto showing other forms of ankle joints according to the invention,

Figs. 6 and 8 are respectively cross-sections on the lines VI-VI and VIII-VIII through Figs. 5 and 7 showing a portion of the foot and the male joint members in each case, and

Figs. 9-11 are partial sections similar to Fig. 1, and Fig. 12 is similar to Fig. 10 showing different joints constructed according to the invention.

Referring to Fig. 1 the artificial limb comprises a leg 1 and foot 2 joined together solely by a block 3 of rubber which is bonded to both leg 1 and foot 2 to form a resilient joint. The leg and foot are solid or hollow metal and preferably of light metal alloys. The leg and foot are formed with obtuse angled diverging opposing faces 4 and 5 respectively and the rubber block 3 is formed with corresponding top and bottom faces 6 and 7 respectively; the arrangement is such that in the normal position faces 4, 5 are similar to and fit snugly onto the faces 6, 7 respectively.

The faces 6, 7 of the rubber block 3 are bonded to the faces 4, 5 respectively by any known rubber-to-metal bonding process. The contours of the faces 4, 5 and 6, 7 are similar so that the rubber block or the like when bonded to the limb members is not subjected to any initial internal stresses or strains. As shewn in Fig. 2, the rubber or similar pad or the like is formed with its faces 6, 7 at a more acute angle than the faces 4, 5 of the leg 1 and foot 2 respectively which results in an initial compression being given to the outer extremities of the pad or the like when its faces 6, 7 are forced into contact with the faces 4, 5 and bonded thereto, this being due to the fact that the angles of the faces 6 and 7 differ from those of the co-operating part of the members 4, 5. The faces may be shaped as in Fig. 1 in the plane shewn or in all directions. Thus the pad or the like is constrained to occupy a central or normal position from which the foot may move about the leg in any direction to flex the joint. The wearer flexes the joint by moving his body as in walking for example. While the normal walking motion tends to flex the foot longitudinally, if the wearer treads on unlevel ground, the foot may also flex transversely and also partly rotate in the horizontal plane. The forces thus set up in the rubber tend to urge it into its normal position, whereby when the foot is free from other forces it returns to the central or normal position.

In the construction shewn in Fig. 3 the leg 1 is formed with a female portion or cavity 8 and the foot 2 is formed with a male projection 9 adapted normally to lie within the cavity 8, leaving a space between the portions 8 and 9. The rubber block 3 is shaped to fill the cavity when the foot is in the normal or central position, and is bonded to the faces of the cavity and the male member.

The inner surfaces of the female member are formed with concave surfaces 10 and the opposing surfaces of the male member are convex as at 11, the two surfaces 10, 11 converging to the central points 12, thus the joint can be pivoted about its central or normal position.

In the constructions shewn in Figs. 3 and 4 the rubber block 3 may be formed with the portions on either side of the central points 12 larger than the corresponding portions of the cavity 8 and adapted to be forced into contact with the cavity walls and bonded thereto whereby the rubber is in a state of initial compression as in Fig. 2.

Male and female members as in Figs. 3 and 4

are preferably shaped in the plane at right angles to the views in Figs. 3 and 4 with circular formation about the vertical axis.

Referring to Figs. 5 and 6, the joint shewn therein is similar to that shewn in Fig. 3. The leg 1 is formed with a cavity 18 and the heel 19 is bored and countersunk as at 20, 21. A joint member 23 comprises a circular lozenge-shaped male member 24 attached to a pin 25 by means of a shoulder 26: the pin 25 is screw-threaded at 27. The pin 25 is inserted in the boring 20 so that the shoulder 26 rests in the upper sunken portion 21: it is secured in place by a nut 28 screwed onto the threaded portion 27 of the pin and thus housed in the bottom sunken portion 21.

The face 29 of the foot is arcuate in formation from back to front (Fig. 6) and transversely is preferably flat, but may also be arcuate if desired. The face 30 of the leg is shaped to correspond and a cavity 18 is formed in the bottom of the leg as in Figs. 3 and 4. A rubber block 31 shaped to fill the cavity 18 is forced into the cavity between the leg and the lozenge-shaped male member 24 and bonded thereto. The block 31 may have an integral washer-shaped member (not shewn) shaped to fill the clearance space 32 between the leg and foot: this washer-shaped member may consist of a separate piece of rubber or like suitable material bonded to the block 30 and/or the adjacent faces 29 and 30 of the foot and leg respectively. The washer-shaped member may be formed with extremities thicker than the width of the clearance space 32 as is the block in Fig. 2, if desired.

The construction shewn in Figs. 7 and 8 is similar to that shewn with reference to Figs. 5 and 6 but with the angles of the walls of the cavity 18, the male member 24 and the rubber pad similar to Fig. 4.

It will be understood that the lozenge-shaped male member 24 in Figs. 5-8 may have concave or convex side surfaces as shewn or it may be flat sided. In these constructions, the rubber or other suitable material is subjected to torsional forces whereas in the other constructions described it is subjected to substantially compression and tension stressed only.

As shown in Fig. 9 the opposing faces 4, 5 of the limb are in the form of obtuse angled end members 16, 17 respectively in which the angle of the one member is greater than that of the other member. The block 3 may be of such shape that its surfaces are forced to conform to the opposing surfaces of the limb members and bonded thereto.

The opposing faces of members may be formed with flat surfaces converging to opposing apices 12 substantially at their centres as in Figs. 1-4 and 9 or they may be arcuate or spherical as shown partially in Fig. 5, as will be understood.

The pivot point 12 may be formed in a joint similar to Figs. 1 and 2 at or substantially at one end 13 of the faces as in Fig. 10 whereby the joint flexes wholly or substantially wholly in one direction.

The rubber or like material may be in one piece or may consist of layers 14 bonded or vulcanized together, as indicated in Fig. 11. The laminated layers may be shaped with converging surfaces as shown or one or more may be plane sheets. Any number of layers may be provided all bonded together and the whole may be formed in a manner similar to that of Fig. 2.

The limb parts may be of metal, wood, plastic or other suitable substance to which rubber or similar material may be bonded or caused to adhere.

Rubber, artificial rubber or other suitable resilient substances may be used. The rubber or other suitable material may be bonded, vulcanized or otherwise caused to adhere to the opposing limb faces in any known manner. Where necessary, the opposing faces of the limb parts may be pre-treated before bonding the rubber thereto, in any known manner.

The angles of the faces of the rubber or like blocks about the pivot point have been described as equal or similar to those of the faces of the limb members to which they are bonded, or as greater than the angles of the limb members' faces (see Fig. 2); it will be understood that they may be less than the angles of the limb member faces so that the rubber or the like is in a state of compression about the pivot point.

The surfaces 4, 5 of the leg and foot and corresponding surfaces 6, 7 of the rubber block and/or washer member in clearance 32 may be corrugated, or provided with uneven surfaces, studs or ridges and corresponding recesses as indicated in Fig. 12. The corrugations, ridges or the like may be arranged longitudinally, transversely, diagonally or in a combination of different directions. Fig. 12 shews a construction similar to Fig. 10 but it will be understood that this formation of the faces to be bonded together may be employed wolly or partially in all the constructions described above.

If desired, the portions of the limb members to which the rubber blocks or the like are to be bonded may be formed separately as attachments and adapted to be secured to the limb members. These joint portions of the limb members may be suitably shaped to fit onto, into or around the main limb members in any suitable manner and may be secured thereto by screws, rivets or any other known means.

Thus, in certain constructions according to the invention, e.g. those shewn in Figs. 3-8, where bonding to the cavity walls is necessary, the completed joint may be secured to the main limb members after bonding.

The joints according to the invention may be employed in any artificial limb joints, as for example, ankles, toes, knees, elbows or wrists.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I

declare that what I claim is:—

1. A jointed artificial limb having two relatively movable limb members wherein opposing faces of the said two limb members are connected together solely by a block, pad or the like of rubber or similar material which is bonded or caused to adhere to the opposing faces of the two limb members thereby forming a resilient joint.

2. A jointed artificial limb member according to claim 1 wherein the opposing faces of the two limb members are formed one with a male and the other with a female portion, the two said portions being connected together solely by a block, pad or the like of rubber or similar material bonded or caused to adhere to the opposing faces of the male and female portions thereby forming a resilient joint.

3. A jointed artificial limb according to claim 1 or 2 wherein the joint is resilient in all directions.

4. A jointed artificial limb according to any one of the preceding claims wherein the opposing faces of the joint are formed to converge about substantially the central point of the joint and the rubber block, pad or the like is shaped to conform to these faces and bonded thereto whereby the rubber is normally constrained to occupy a central position but may flex in any direction so that one part may move with respect to the other in any direction while the forces thus set up within the rubber tend to urge it when free to return to the normal or central position.

5. A jointed artificial limb according to any one of the preceding claims wherein the opposing faces of the limb parts joined by the rubber or similar block or the like are so formed that the angles of the faces are nesting and obtuse angles, the angle of one being greater than that of the other.

6. A jointed artificial limb according to Claim 1 wherein the rubber or similar block or the like is of such shape that, when its surfaces are forced to conform to the opposing surfaces of the limb members and bonded thereto, the extremities of the block will be in a state of compression.

7. A jointed artificial limb according to Claim 1 wherein the rubber or similar block or the like is of such shape that, when its surfaces are forced to conform to the opposing surfaces of the limb members and bonded thereto, the central portion of the block will be in a state of compression.

8. A jointed artificial limb according to any one of claims 2-4 wherein the male and female members are adapted to fit one within the other, the male member being smaller than the female member to leave a space between the two limb members in which the rubber or the like is interposed and bonded or caused to adhere to the opposing faces of the two members.

9. A jointed artificial limb according to Claim 8 wherein the opposing faces of the two members comprise a concave outer or female face and a convex inner or male face, the two faces being closest at substantially their central portions and diverging outwards whereby the joint can be pivoted substantially about its central portion in every direction.

10. A jointed artificial limb according to claim 8 or 9 wherein the male face comprises a substantially circular or oval lozenge-shaped member secured to or integral with the foot member.

11. A jointed artificial limb according to any one of the claims 2 to 5 wherein the male and female members are formed with flat, arcuate or spherical faces converging to opposing apices substantially at the centre of their length.

12. A jointed artificial limb according to claim 1 wherein the opposing faces of the two limb members converge towards each other whereby a pivot point is formed at one end of the faces.

13. A jointed artificial limb according to any one of the preceding claims wherein the block comprises a series of layers of rubber or like material bonded together, the outer surfaces of the outer layers being bonded to the two limb members.

14. Jointed artificial limbs according to any one of the preceding claims wherein the faces of the rubber or similar block or the like and the limb faces to which they are to be bonded are formed with inter-engaging corrugations, studs, ridges or other uneven surfaces.

15. Jointed artificial limbs according to any one of the preceding claims wherein the rubber or like blocks or the like are bonded to separate attachments in turn adapted to be secured to the main limb members.

16. Artificial limbs substantially as hereinbefore described with reference to the accompanying drawings.

Dated this 26th day of June, 1947.
ABEL & IMRAY,
Agents for the Applicant,
Quality House, Quality Court, Chancery Lane,
London, W.C.2.

Printed for H.M. Stationery Office by the Redditch Indicator Co., Ltd., Redditch, Code 39-242.—1949.
Published at the Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies, price 2s. 0d. each (inland), 2s. 1d. (abroad) may be obtained.

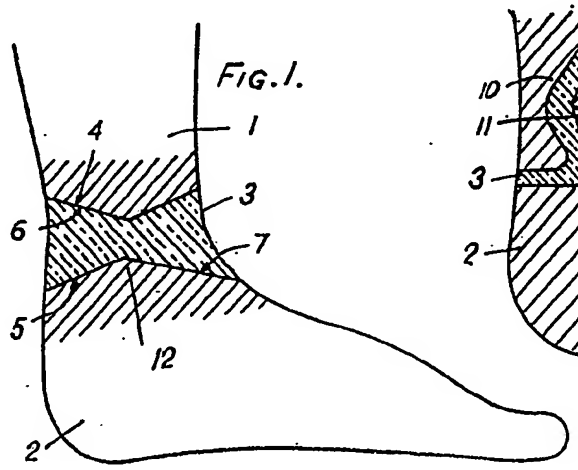


FIG. 1.

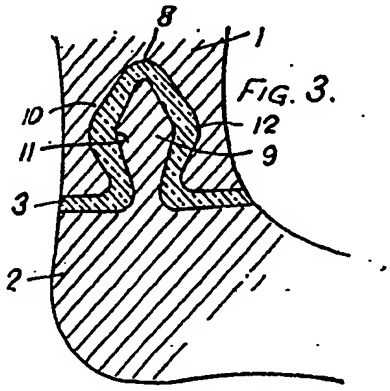


FIG. 3.

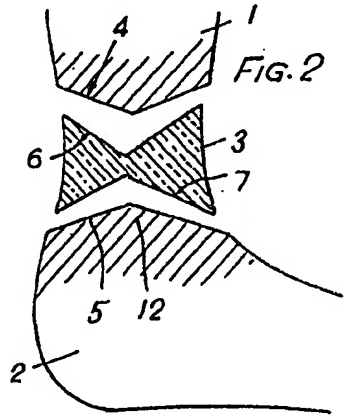


FIG. 2

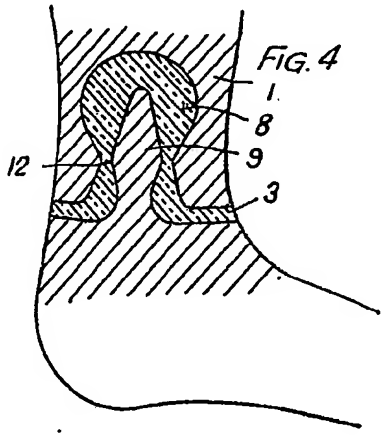


FIG. 4

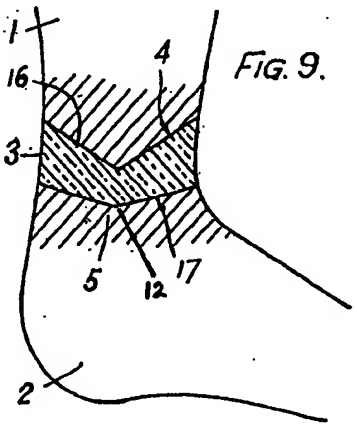


FIG. 9.

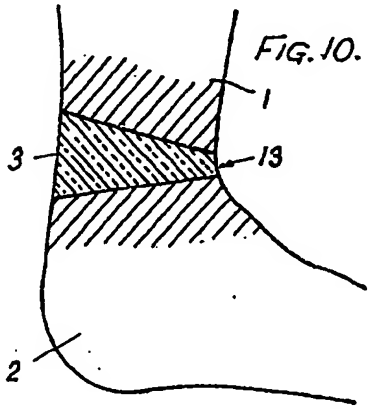


FIG. 10.

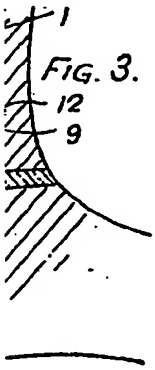


FIG. 3.

FIG. 4

FIG. 10.

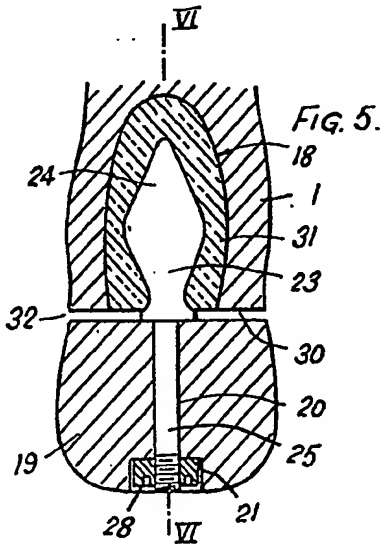


FIG. 5.

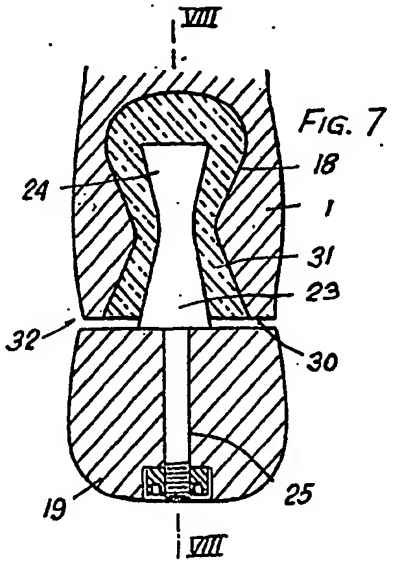


FIG. 7.

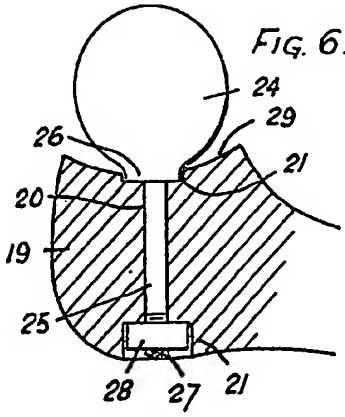


FIG. 6.

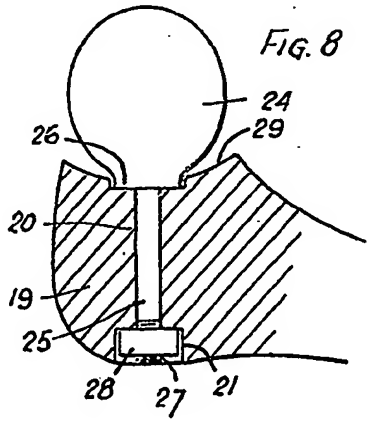


FIG. 8

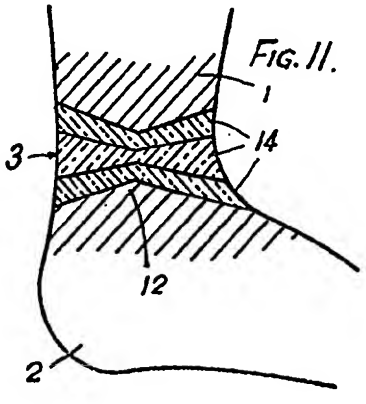


FIG. 11.

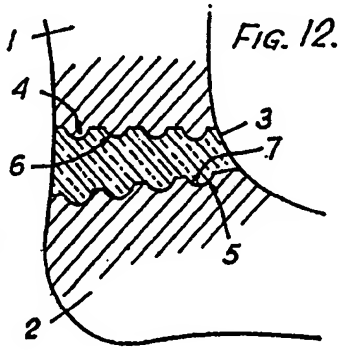


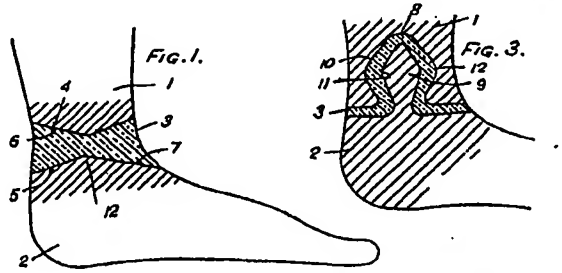
FIG. 12.

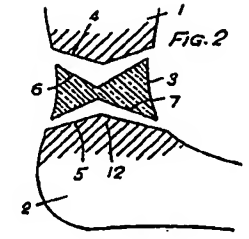
H.M.S.O.(Ty.P.)

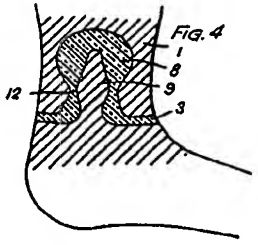
621,576 COMPLETE SPECIFICATION

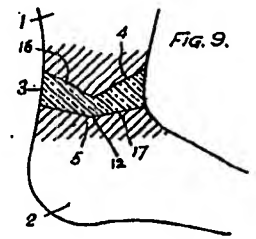
2 SHEETS

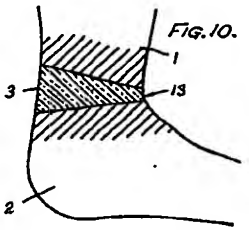
SHEET 1



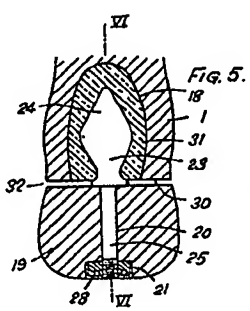


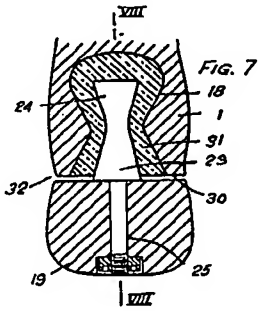


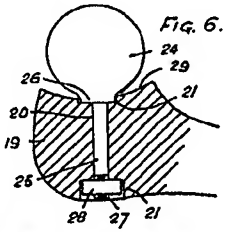


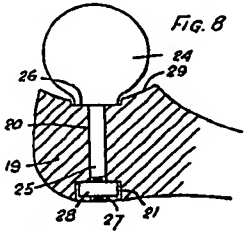


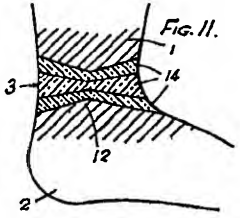
SHEET 2

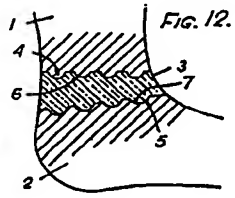












[This Drawing is a reproduction of the Original on a reduced scale]

H.M.S.O.(Ty.P)